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New records of crustose *Teloschistaceae* and lichenicolous fungi from Turkey

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Abstract — Two lichenized fungi (*Flavoplaca austrocitrina*, *F. dichroa*) and two lichenicolous fungi (*Tremella caloplacae*, *Xanthoriicola physciae*) are reported from Turkey for the first time. Comments on their habitats, substrata, and key anatomical features are provided for each species.

Key words — biodiversity, lichens, hyphomycetes, *Ascomycota*, *Basidiomycota*

Introduction

There is still no checklist of Turkish lichens and lichenicolous fungi although intensive lichenological studies have been carried especially in the last two decades in the country and numerous papers have been published (John 2007, Şenkardeşler 2011). Approximately 1200 lichenized fungal species are known from Turkey, but at least 2000 lichenized fungal species might reasonably be expected to be present in the country, considering its size and diversity of phytogeographical regions and habitats (Halıcı et al. 2007).

A key to lichenicolous *Ascomycota* and mitosporic fungi for Turkey prepared by Halıcı (2008) listed 118 taxa from the country. Currently, 182 taxa of lichenicolous fungi are known from Turkey (Halıcı et al. 2014), but even very common lichenicolous basidiomycetes have not been reported.

During 2012–14 many crustose teloschistacean specimens and lichenicolous fungi were collected from Turkey. In this paper I discuss two lichenized and two lichenicolous species that are new to Turkey.

Material & methods

Sections were prepared by hand and examined in Lugol's Merck 9261, 10% KOH, cotton blue, and water. The measurements of ascospores taken in water are given as:

(min–)[X–sd]–*X*–[X+sd](–max.), where 'min.' and 'max.' represent the extreme values, '*X*' the arithmetic mean, and 'sd' the corresponding standard deviation. Measurements are presented in the classical way where ten or fewer measurements were made. The specimens are deposited in Erciyes University Herbarium, Kayseri, Turkey (EUH).

Taxonomy

Flavoplaca austrocitrina (Vondrák, Říha, Arup & Søchting) Arup, Søchting & Frödén

A detailed description is provided by Vondrák et al. (2009).

Thallus yellow to somewhat brownish orange, areolate; most areoles convex, almost subsquamulose; 275–400 µm thick and 0.35–1.3 mm in diam. Areoles with marginal soralia; but in the old thalli areoles are usually totally covered by soredia. Apothecia sometimes present; (0.2–)0.2–*0.6*–1.0(–1.5) mm in diam., zeorine, with thalline exciple prominent especially in the old apothecia. Hymenium (50–)58–*73*–87 (–90) µm tall. Paraphyses tips (4–)5–*5.5*–6.5(–7) µm wide. Ascospores colourless and polarilocular, (9–)11–*12.5*–14(–16) × (4.5–)5.5–*6.5*–7.5(–8.5) µm; septa wide, (2–)3–*4*–5(–6.5) µm, length/width: (1.44–)1.71–*2.04*–2.36(–2.89); septum/length: (0.14–)0.23–*0.31*–0.4(–0.44). Pycnidium not observed.

Specimens examined: **TU'RKEY**, Adana, Ceyhan, Kızıldere Village, 36°56′N 35°41′E, alt. 200 m, on mortar, 28 August 2013, M.G. Halıcı (ERC CL 1.689); **İçel**, Çamlıyayla, near Güzeloluk, *Pinus brutia* forest, on limestone, 37°10′N 34°48′E, alt. 620 m, on limestone, 25 February 2012, M.G. Halıcı (ERC CL 0.262); **İzmit**, Karamürsel, Tepeköy, 40°41′N 29°39′E, alt. 230 m, on mortar, 21 May 2012, M.G. Halıcı (ERC CL 1.832); **Kirklareli**, Center, west of İnece, near Ulukonak Village, on limestone, 41°32′N 27°06′E, alt. 100 m, on limestone, 29 May 2012, M.G. Halıcı (ERC CL 0.383).

According to Vondrák et al. (2009), *Flavoplaca austrocitrina* is common both inland and in coastal areas of Europe on lime-rich artificial substrata such as concrete and mortar but also on limestone. In Turkey we reported it on both natural limestone and mortar in suburban areas near the coast and inland mostly below 250 m. A related species, *F. flavocitrina* (Nyl.) Arup et al., has similar soralia and ecology but differs in its thinner and smaller areoles (Vondrák et al. 2009). New to Turkey and to Asia.

Flavoplaca dichroa (Arup) Arup, Frödén & Søchting

Detailed descriptions are provided by Arup (2006), Vondrák et al. (2009), and Wilk (2011).

Thallus continuous, areolate, of two color forms, yellow and orange. Areoles 0.3–0.45 mm in diam., and more or less totally covered by blastidia/soredia. Cortex indistinct, with 1–2 layers of cells. Apothecia common in most specimens, 0.2–0.8 mm in diam. In mature apothecia disc slightly concave or sometimes convex, zeorine, thalline exciple mostly covered by blastidia/soredia and clearly visible. Hymenium (45–)51–*64*–77(–85) µm tall. Tips of paraphyses (4–)4.5–*5.55*–6.5(–8.5) µm wide. Ascospores colorless, polarilocular, thin-walled, (9–)10–*12*–14(–16) × (4.5–)5.5–*6.5*–7.5(–8.5) µm, septa (1.5–)2.5–*3.5*–4.5(–5.5) µm, length/width: (1.25–)1.6–*1.93*–2.26(–2.8), septum/length: (0.16–)0.21–*0.29*–0.36(–0.5).

Specimens examined: TURKEY, Amasya, Borabay, north of Borabay Village, *Pinus sylvestris* forest, 40°09′N 36°08′E, alt. 1480 m, on calcareous rocks, 28 August 2012, M.G. Halıcı (ERC CL 0.224); Aydin, Nazilli, Toygar Village, 37°49′N 28°21′E, alt. 90 m, on weakly calcareous rocks, 2 July 2012, M.G. Halıcı (ERC CL 0.776); Samsun, Ladik, east of Akdağ Ski Center, 40°54′N 35°53′E, alt. 960 m, on calcareous rocks, 28 August 2012, M.G. Halıcı (ERC CL 1.571); Tokat, Çamlıbel, southwest of Tekreli Village, 40°10′N 36°30′E, alt. 1450 m, on calcareous rocks, 29 August 2012, M.G. Halıcı (ERC CL 0.695).

Flavoplaca dichroa can easily be recognized in the field by its yellow and orange thallus forms growing side by side (Arup 2006; Vondrák et al. 2009). It differs from *F. austrocitrina* (see above) by a thinner thallus. According to Arup (2006) the thick-walled ascospores (sand-clock type) are diagnostic for the Nordic specimens but in the Turkish specimens the ascospores are regularly thin-walled ascospores as it was mentioned by Vondrák et al. (2009) for the specimens from the Black Sea Region. Wilk (2011) also stated that Polish specimens of this species have thick-walled ascospores. This species is common in Europe (Arup 2006; Vondrák et al. 2007) and seems to be widely distributed in Turkey on sun exposed calcareous rocks mostly over 1000 m altitude. New to Turkey and to Asia.

Tremella caloplacae (Zahlbr.) Diederich

A detailed description is provided by Diederich (1996).

No distinct basidiomata visible; induces formation of hardly visible galls inside the hymenium of *Calogaya biatorina* (A. Massal.) Arup et al. Concolorous with the host thallus. Basidia separated by one septum, 16–25 × 7–10 µm. No visible damage was seen but in the infected apothecia ascospore production was suppressed.

Specimen examined: TURKEY, Elaziğ, Harput, Buzluk Cave, 38°44′N 39°16′E, alt. 1570 m, in the hymenium of *Calogaya biatorina* on calcareous rocks, 08 July 2013, M.G. Halıcı (ERC CLL 0.051).

Actually we were not initially aware of this fungus as no distinct galls were formed in the host lichen. However, ITS analyses of several apothecia from the host revealed the existence of *Tremella caloplacae*. Thereafter, we made additional apothecial sections and observed the *T. caloplacae* basidia. This species is known from Algeria and several European countries including the island of Crete in Greece in the hymenia of *Calogaya arnoldii* (Wedd.) Arup et al., *Caloplaca saxicola* (Hoffm.) Nordin, *Rufoplaca arenaria* (Pers.) Arup et al., *Rusavskia elegans* (Link) S.Y. Kondr. & Kärnefelt, *Xanthoria sorediata* (Vain.) Poelt, *Variospora aurantia* (Pers.) Arup et al., and *Usnochroma carphineum (*Fr.) Søchting et al. (e.g., Sérusiaux et al. 2003; Diederich 2007; Alstrup et al. 2009; Etayo 2010; Millanes et al. 2014). All the specimens having two-celled basidia on teloschistalean hosts are currently classified under this species (Millanes et al. 2014). New to Turkey and to Asia.

Xanthoriicola physciae (Kalchbr.) D. Hawksw.

A detailed description is provided by Hawksworth & Punithalingam (1973).

The hyphomycete grows in the hymenium of the host apothecia, which becomes blackish and thus easily seen in the field. Conidiophores brown, immersed, branched, smooth-walled. Conidiogenous cells broadly cupulate. Conidiogenesis enteroblastic. Conidia dark brown to almost black, globose, 3–6 µm in size, aseptate with warted wall, produced singly, not in chains,.

Specimen examined: TURKEY, Bursa, İznik, on the highway to İhsaniye, 40°27′N 29°48′E, alt. 710 m, on the apothecia of *Xanthoria parietina*, 23 May 2012, M.G. Halıcı (ERC CLL 0.071).

According to LSU sequence analyses (Ruibal et al. 2011), *Xanthoriicola* belongs to the order *Capnodiales*. This conspicuous species, which grows almost exclusively on *Xanthoria parietina* (L.) Beltr., is widely distributed in Europe and known also in Asia and Africa but has not previously been found in Turkey.

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